Materials Okamoto, Mosely, Ishada , 2006)

As shown in Figure 1, five sets of three cards each ($4'' \times 6''$) were prepared to show the five rational number perspectives (Behr et al., 1992; Marshall, 1993). Each perspective was shown in three formats: a word problem text, a corresponding pictorial representation of the quantity relation, and a corresponding value expressed in mathematical notation. Participants who grouped the cards in a manner consistent with the formal domain analysis would therefore produce five separate groupings of three representation cards (text, picture and notation), with each group conveying the same rational number perspective.

A video camera and a handheld audio tape recorder were used to document each participant's responses and organization of the cards during the task. The video camera was placed on a tripod looking down at the cards. An external boundary microphone was attached to the camera and placed on the table to insure that the participants' verbal responses were recorded clearly. The handheld cassette recorder was placed on the table next to the participant and used only as a backup in case the audio portion of the video camera was compromised.

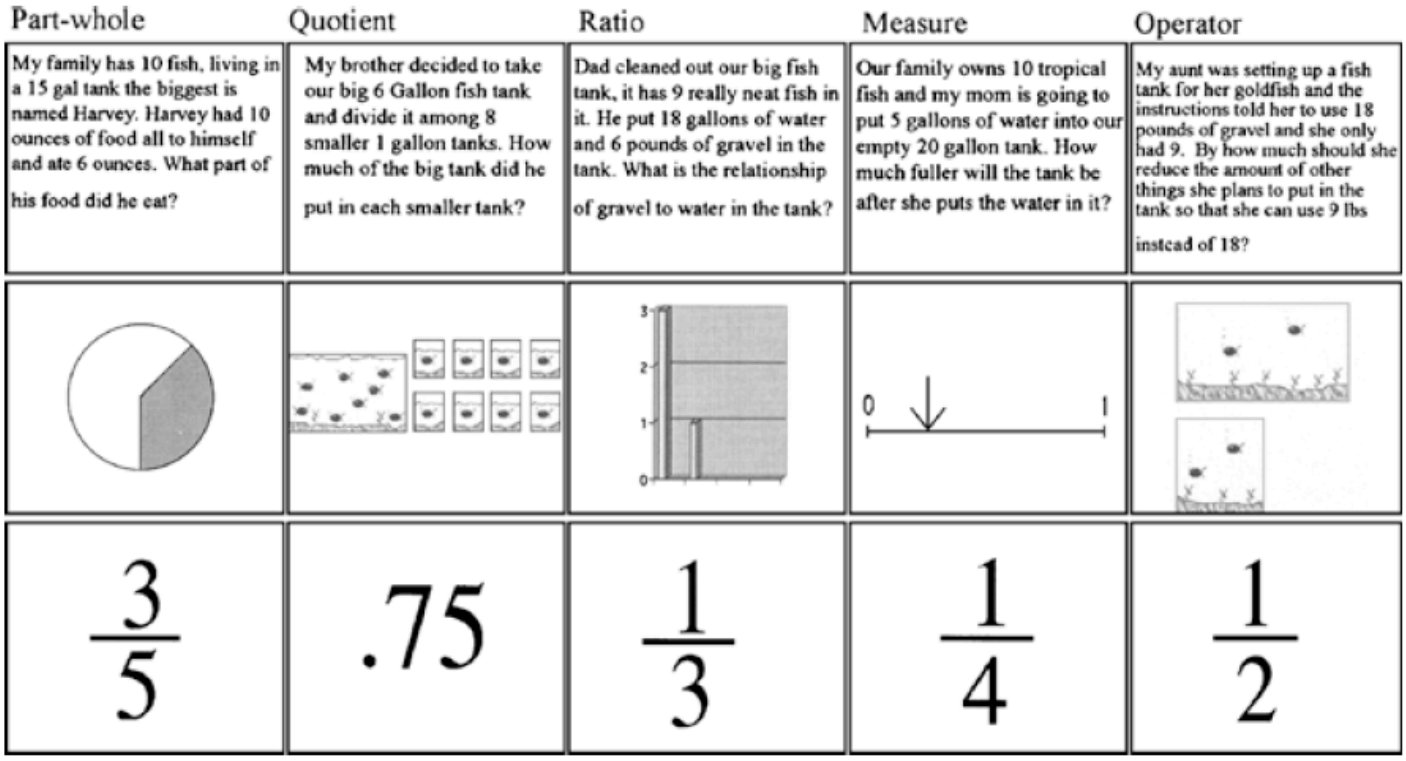

Figure 1. Overview of fifteen sort cards representing the five rational number perspectives.

Procedure

Native speakers conducted individual interviews in each nation. Each interview consisted of three categories of questions: general teaching background, mathematics training/background, and knowledge of rational numbers (see Table II). The final category of questions was asked in reference to the card sorting task.

After the general teaching and mathematics teaching backgrounds were discussed, the participants were asked to sort the 15 rational number cards into groupings that reflected mathematical relations. All participants were instructed to verbalize their thoughts while making their groupings. An interviewer took notes as the participants organized the representation cards into groups, documenting the groupings as well as important reactions to the task. The interviewer also prompted the participants to continue to speak and verbalize their thoughts as completely as possible whenever participants fell silent. Once all the cards had been organized to the participants' satisfaction, the interviewer asked the participants to explain their categories, followed by a series of questions designed to assess the participants' rational number understanding as well as their views of the task content's relevance to students' mathematical thinking.